In re Application of Michael J. Rieschl et al.
Apparatus & Method for the Simulation of a Large Main Memory
Address Space Given Limited Resources
File #RA 5618 (3203.01US01) - Customer #27516
Attorney: Charles A. Johnson; Reg. #20,852; 651-635-7702
Express Mail ER726458438US
Drawing 1 of 9

Maximum Program Banks

Memory Banks

Initial load banks
= 512

Total Number of
banks = 65,536

Page
Files

Page
Files

Max Files = 100

Maximum File Size
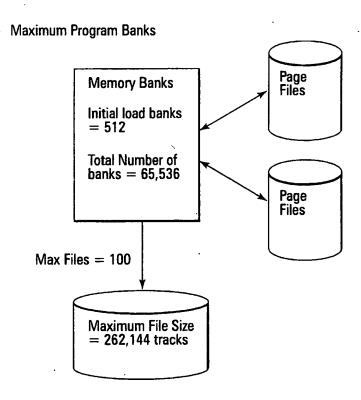= 262,144 tracks

$\mathcal{F}ig. 1$

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Interface Input
117

100

Main
Memory
Address
116

Simulated Memory
Access Scheme
102

Fast Memory
Access Scheme
104

Slow Memory
Access Scheme
106

124

119

126

Pages
Input/Output
118

Page Address   Page(s)

File Paging System
108

Page(s)   Page(s)

110

| Page 0 |
| Page 1 |
| Page 2 |
| ... |
| Page n |

| 124 |
| 112 |
| 126 |

| Page 0 |
| Page 1 |
| Page 2 |
| ... |
| Page n |

| Page 0 |
| Page 1 |
| Page 2 |
| ... |
| Page n |

114   115

Fig. 2

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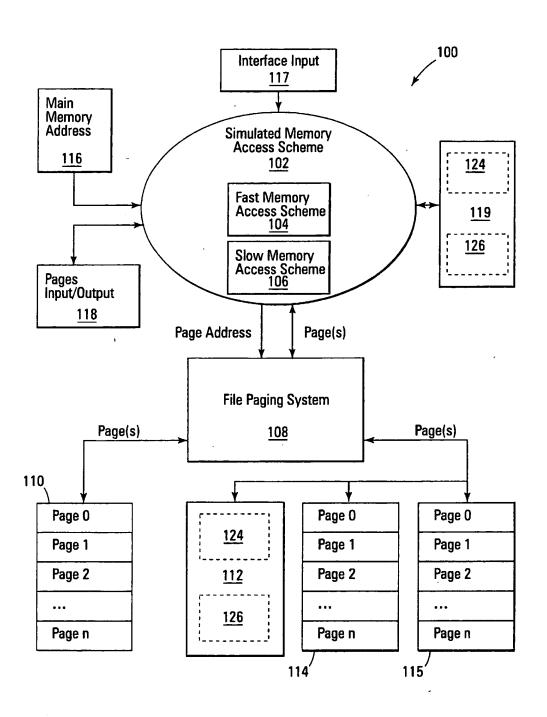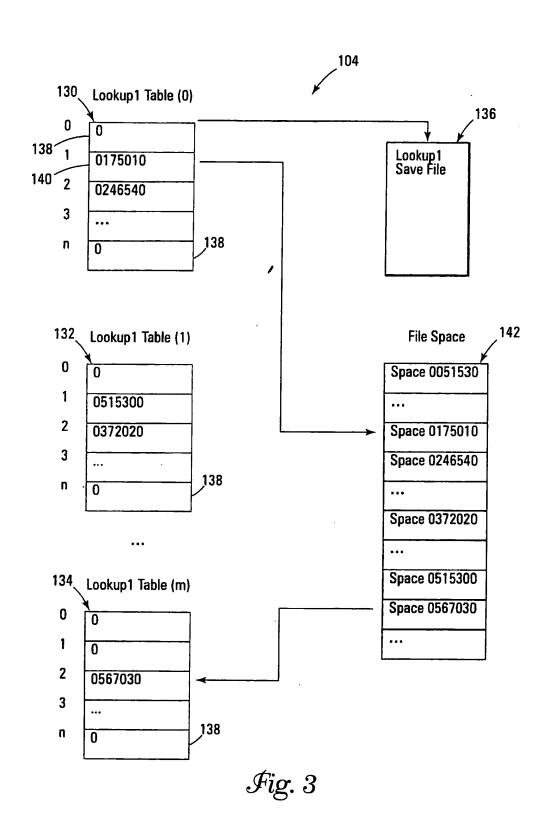Express Mail ER726458438US
Drawing 3 of 9

104

130 Lookup1 Table (0)

0	0
1	0175010
2	0246540
3	...
n	0

138
140
138

136

Lookup1
Save File

132 Lookup1 Table (1)

0	0
1	0515300
2	0372020
3	...
n	0

138

...

134 Lookup1 Table (m)

0	0
1	0
2	0567030
3	...
n	0

138

File Space   142

Space 0051530
...
Space 0175010
Space 0246540
...
Space 0372020
...
Space 0515300
Space 0567030
...

Fig. 3

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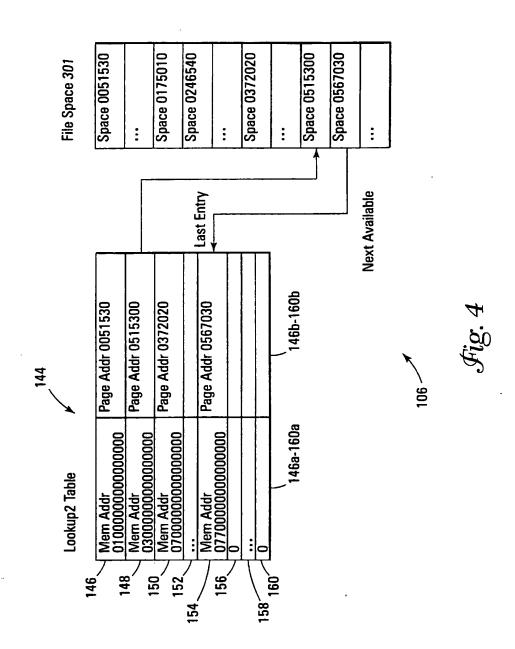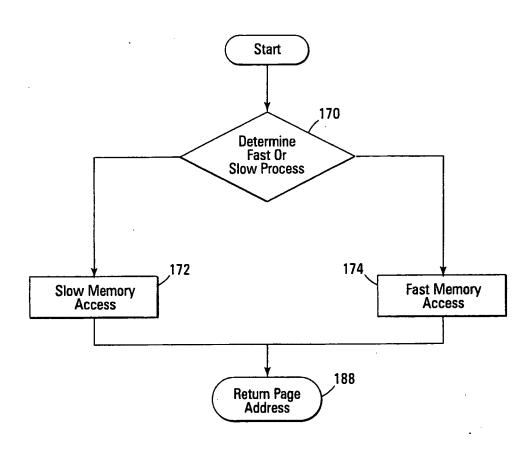Express Mail ER726458438US
Drawing 4 of 9

File Space 301

Space 0051530
...
Space 0175010
Space 0246540
...
Space 0372020
...
Space 0515300
Space 0567030
...

Next Available

Last Entry

144

Lookup2 Table

Mem Addr 01000000000000000	Page Addr 0051530
Mem Addr 03000000000000000	Page Addr 0515300
Mem Addr 07000000000000000	Page Addr 0372020
...	
Mem Addr 07700000000000000	Page Addr 0567030
0	
...	
0	

146a-160a   146b-160b

146
148
150
152
154
156
158
160

106

Fig. 4

```
                    ┌─────────┐
                   (   Start   )
                    └─────────┘
                         │
                         ▼        170
                       ╱────╲
                      ╱      ╲
                     ╱ Determine╲
                    ◄  Fast Or   ►
                     ╲Slow Process╱
                      ╲        ╱
                       ╲────╱
        │                                      │
        ▼            172              174      ▼
┌──────────────┐                    ┌──────────────┐
│ Slow Memory  │                    │ Fast Memory  │
│   Access     │                    │   Access     │
└──────────────┘                    └──────────────┘
        │                                      │
        └──────────────┬───────────────────────┘
                       ▼
                 ┌──────────┐   188
                ( Return Page )
                ( Address     )
                 └──────────┘
```
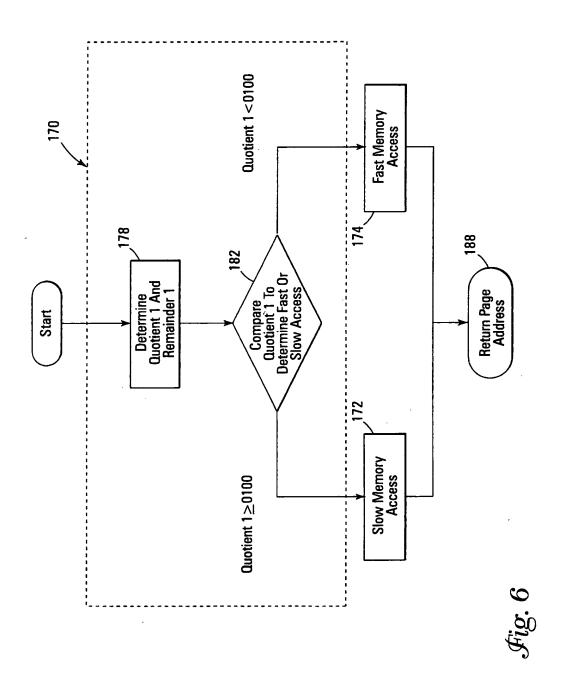
Fig. 5

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170

Start

178

Determine
Quotient 1 And
Remainder 1

182

Compare
Quotient 1 To
Determine Fast Or
Slow Access

Quotient 1 < 0100

Quotient 1 ≥ 0100

174

Fast Memory
Access

172

Slow Memory
Access

188

Return Page
Address

Fig. 6

Start ⟵ 169

170

Search Slow
Memory Look-up
Table ⟵ 190

192

Main Memory
Address Within
Range?

Yes

No

194

Next Paging
Address
Available?

No

Yes

195

Table Full
Error Exit

If Q1 Even, Get Address
From File 1, Else Get
Address From File 2 ⟵ 196

Store Address In Look-up Table
And Update Next Available
Address ⟵ 198

Subtract Requested Address
From Base Address, Add Result
To Base And Store As PA ⟵ 200
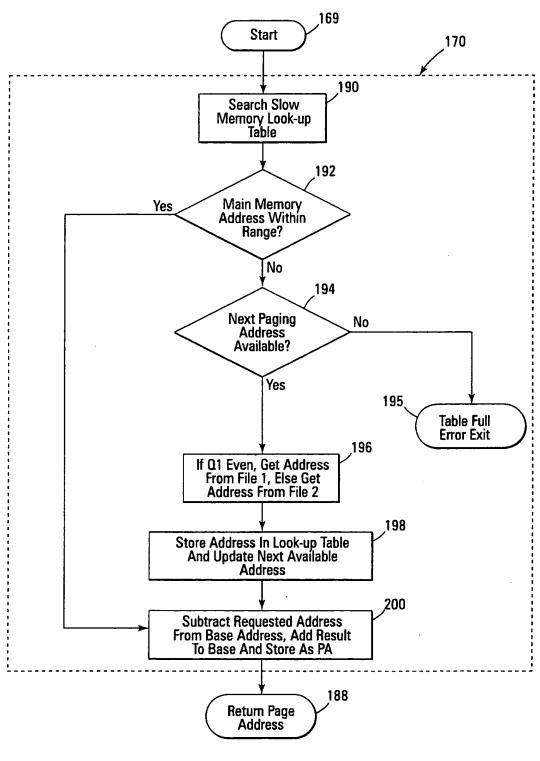
Return Page
Address ⟵ 188

Fig. 7

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Drawing8 of 9

```
                    ( Start )                          174

                         |
          +------------------------------+  202
          |     Calculate Word Offset    |
          +------------------------------+
                         |
          +------------------------------+  204
          |   Determine Quotient 2 And   |
          |         Remainder 2          |
          +------------------------------+
                         |
          +------------------------------+  206
          |    Index Look-up Table Using |
          |          Quotient 2          |
          +------------------------------+
                         |
                        / \            208
                       /   \
               Yes    / Paged\
          <----------<  Address In  >
                      \ Look-up /
                       \ Table?/
                        \ /
                         | No
          +------------------------------+  210
          | If Q2 Even, Get Address      |
          |  From File 1, Else Get       |
          |    Address From File 2       |
          +------------------------------+
                         |
          +------------------------------+  212
          |   Store Address In Look-up Table |
          |   And Update Next Available   |
          |           Address            |
          +------------------------------+
                         |
          +------------------------------+  214
          |  Calculate Paging Address Of |
          |   Memory, Add Result To      |
          |  Remainder 2 And Store As PA |
          +------------------------------+
                         |
                   ( Return Page )     188
                   (   Address   )
```
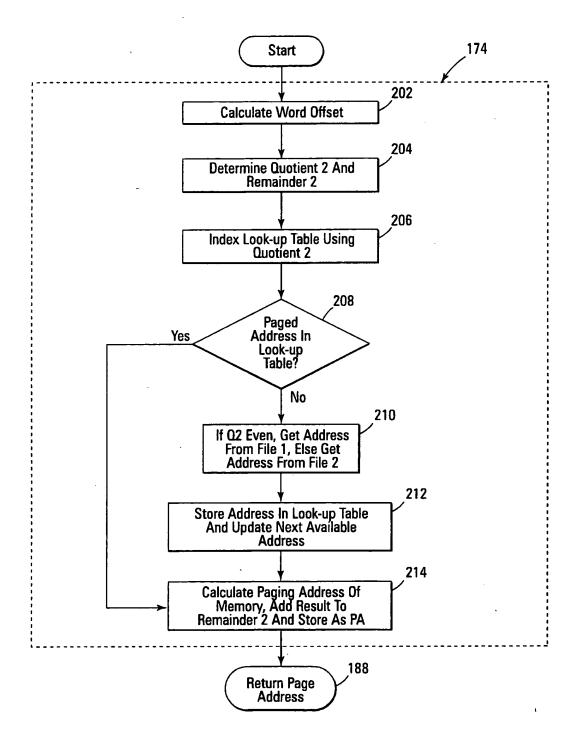
Fig. 8

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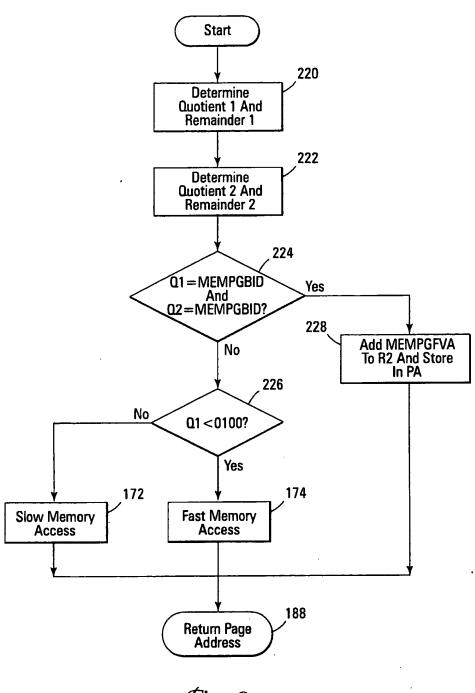Express Mail ER726458438US
Drawing 9 of 9

Start

Determine
Quotient 1 And
Remainder 1 —220

Determine
Quotient 2 And
Remainder 2 —222

Q1=MEMPGBID
And
Q2=MEMPGBID? —224

Yes → Add MEMPGFVA
To R2 And Store
In PA —228

No

Q1<0100? —226

No → Slow Memory
Access —172

Yes → Fast Memory
Access —174

Return Page
Address —188

Fig. 9